

We Claim:

1. A process for preparing functional group-containing olefinic compounds comprising the steps of:

5 (a) reacting (1) at least one alkylidene phosphorane comprising an alkylidene moiety and three other moieties bonded to its phosphorus atom, said alkylidene moiety optionally comprising one or more carbon to carbon double or triple bonds, with (2) at  
10 least one carbonyl-containing compound that comprises at least one group that is a leaving group, or that is capable of subsequent conversion to a leaving group, and that optionally comprises one or more isolated carbon to carbon double or triple bonds, to form an  
15 olefinic compound that comprises at least one leaving group, said carbonyl-containing compound being selected from the group consisting of ketones and aldehydes; and  
(b) reacting said olefinic compound with at least one functional group-containing nucleophile to form the  
20 corresponding functional group-containing olefinic compound.

2. The process of claim 1 further comprising the step of reacting a phosphonium salt, a phosphine oxide, or a  
25 phosphonate with a base to form said alkylidene phosphorane.

3. The process of claim 1 further comprising the step of oxidizing an alcohol having at least one group that is a leaving group, or that is capable of subsequent conversion  
30 to a leaving group, to form said carbonyl-containing compound.

4. The process of claim 1 wherein said functional group-containing olefinic compound is an olefinic ester, and further comprising the step of hydrolyzing said functional group-containing ester to form the corresponding alcohol.

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5. The process of claim 1 wherein said alkylidene moiety of said alkylidene phosphorane contains no carbon to carbon double or triple bonds.

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6. The process of claim 1 wherein said alkylidene moiety of said alkylidene phosphorane contains one carbon to carbon double bond.

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7. The process of claim 1 wherein said three other moieties of said alkylidene phosphorane are independently selected from the group consisting of aryl and hetaryl.

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8. The process of claim 1 wherein said three other moieties of said alkylidene phosphorane are independently selected from the group consisting of alkyl and cycloalkyl.

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9. The process of claim 1 wherein one moiety of said three other moieties of said alkylidene phosphorane is an oxy anion, and the other two moieties of said three other moieties of said alkylidene phosphorane are independently selected from the group consisting of alkyl, cycloalkyl, aryl, hetaryl, and alkoxy.

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10. The process of claim 1 wherein said carbonyl-containing compound contains no carbon to carbon double or triple bonds.

11. The process of claim 1 wherein said carbonyl-containing compound is an aldehyde.

12. The process of claim 11 wherein said aldehyde is  
5 selected from the group consisting of 4-halobutan-1-al, 8-halooctan-1-al, 9-halnonan-1-al, and 11-haloundecan-1-al.

13. The process of claim 12 wherein said aldehyde is  
10 selected from the group consisting of 4-chlorobutan-1-al, 8-bromooctan-1-al, 9-bromononan-1-al, and 11-bromoundecan-1-al.

14. The process of claim 1 wherein the carbonyl moiety  
15 of said carbonyl-containing compound is bonded to the  $\alpha$ -carbon atom of the longest chain of said carbonyl-containing compound, and said group that is a leaving group, or that is capable of subsequent conversion to a leaving group, is bonded to the  $\omega$ -carbon atom of said longest chain.

20 15. The process of claim 1 wherein said group of said carbonyl-containing compound is a leaving group.

16. The process of claim 15 wherein said leaving group  
25 is selected from the group consisting of halogens, carboxylates, sulfonates, ammonium, and oxonium.

17. The process of claim 1 wherein said functional  
30 group-containing nucleophile is selected from the group consisting of carboxylates, sulfoxides, nitrogen oxides, hydroxides, and mixtures thereof.

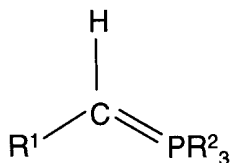
18. The process of claim 17 wherein said functional group-containing nucleophile is selected from the group consisting of carboxylates and hydroxides.

5        19. The process of claim 18 wherein said carboxylates are acetates.

20. The process of claim 19 wherein said functional group-containing nucleophile is selected from the group consisting of metal hydroxides and metal acetates.  
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21. A process for preparing pheromone compounds comprising the steps of:

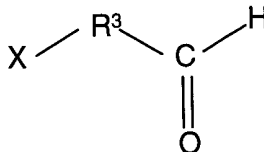
15        (a) reacting (1) a phosphorane compound selected from those represented by the following general formula:



wherein:

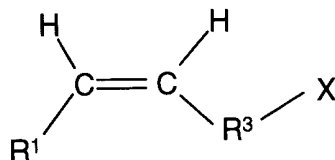
20         $\text{R}^1$  is selected from the group consisting of hydrogen, alkyl groups, alkenyl groups, and alkynyl groups; and each  $\text{R}^2$  is independently selected from the group consisting of aryl groups and hetaryl groups; with (2) an aldehyde selected from those represented by the following general formula:

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wherein:

X is a leaving group; and R<sup>3</sup> is selected from the group consisting of alkylene, alkenylene, and alkynylene;  
5 to form an olefinic compound represented by the following general formula:

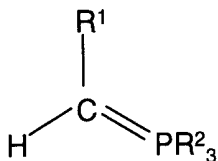


and

(b) reacting said olefinic compound with at least one  
10 carboxylate, sulfoxide, nitrogen oxide, or hydroxide to form the corresponding olefinic acetate, olefinic alcohol, olefinic aldehyde, or olefinic ketone.

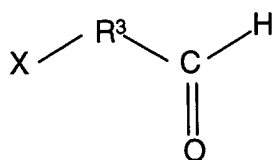
22. A process for preparing pheromone compounds  
15 comprising the steps of:

(a) reacting (1) a phosphorane compound selected from those represented by the following general formula:



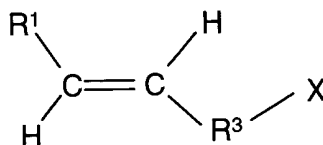
20 wherein:

R<sup>1</sup> is selected from the group consisting of hydrogen, alkyl groups, alkenyl groups, and alkynyl groups; and each R<sup>2</sup> is independently selected from the group consisting of alkyl groups and cycloalkyl groups;  
25 with (2) an aldehyde selected from those represented by the following general formula:



wherein:

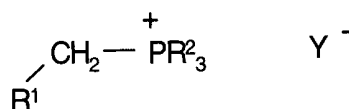
X is a leaving group; R<sup>3</sup> is selected from the group  
 5 consisting of alkylene, alkenylene, and alkynylene;  
 to form an olefinic compound represented by the following  
 general formula:



and

10 (b) reacting said olefinic compound with at least one  
 carboxylate, sulfoxide, nitrogen oxide, or hydroxide to form  
 the corresponding olefinic acetate, olefinic alcohol,  
 olefinic aldehyde, or olefinic ketone.

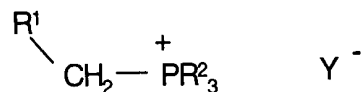
15 23. The process of claim 21 further comprising the  
 step of reacting a phosphonium salt represented by the  
 following general formula:



wherein:

20 R<sup>1</sup> is selected from the group consisting of hydrogen,  
 alkyl groups, alkenyl groups, and alkynyl groups; each  
 R<sup>2</sup> is an independently selected aryl or hetaryl group;  
 and Y<sup>-</sup> is selected from the group consisting of halides,  
 aryl or alkyl sulfonates, and borates;  
 25 with a base to form said phosphorane compound.

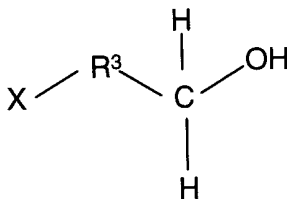
24. The process of claim 22 further comprising the step of reacting a phosphonium salt represented by the following general formula:



5 wherein:

$\text{R}^1$  is selected from the group consisting of hydrogen, alkyl groups, alkenyl groups, and alkynyl groups; each  $\text{R}^2$  is an independently selected alkyl or cycloalkyl group; and  $\text{Y}^-$  is selected from the group consisting of  
10 halides, aryl or alkyl sulfonates, and borates;  
with a base to form said phosphorane compound.

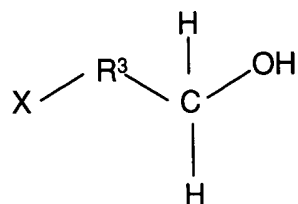
25. The process of claim 21 further comprising the step of oxidizing an alcohol represented by the following  
15 general formula:



wherein:

$\text{X}$  is a leaving group; and  $\text{R}^3$  is selected from the group consisting of alkylene, alkenylene, and alkynylene;  
20 to form said aldehyde.

26. The process of claim 22 further comprising the step of oxidizing an alcohol represented by the following general formula:



wherein:

5 X is a leaving group; and R<sup>3</sup> is selected from the group consisting of alkylene, alkenylene, and alkynylene; to form said aldehyde.

27. The process of claim 21 wherein said R<sup>1</sup> has from 1 to about 24 carbon atoms.

10 28. The process of claim 27 wherein said R<sup>1</sup> is an alkyl group.

29. The process of claim 28 wherein said R<sup>1</sup> is selected from the group consisting of ethyl and propyl.

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30. The process of claim 22 wherein said R<sup>1</sup> has from 1 to about 24 carbon atoms.

20 31. The process of claim 30 wherein said R<sup>1</sup> is an alkyl group or an alkenyl group.

32. The process of claim 31 wherein said R<sup>1</sup> is selected from the group consisting of propenyl and *n*-octyl.

25 33. The process of claim 21 wherein each said R<sup>2</sup> is phenyl.



34. The process of claim 22 wherein each said  $R^2$  is selected from the group consisting of *n*-butyl and *n*-nonyl.

5 35. The process of claim 21 wherein said  $R^3$  has from 1 to about 24 carbon atoms.

36. The process of claim 35 wherein said  $R^3$  is selected from the group consisting of heptylene and decylene.

10 37. The process of claim 22 wherein said  $R^3$  has from 1 to about 24 carbon atoms.

38. The process of claim 37 wherein said  $R^3$  is propylene or heptylene.  
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39. The process of claim 21 wherein said X is selected from the group consisting of Cl, Br, tosylate, mesylate, trifluoroacetate, and I.

20 40. The process of claim 39 wherein said X is Cl or Br.

41. The process of claim 22 wherein said X is selected from the group consisting of Cl, Br, tosylate, mesylate, 25 trifluoroacetate, and I.

42. The process of claim 41 wherein said X is Cl or Br.

30 43. A process for preparing functional group-containing olefinic compounds comprising the steps of:  
(a) reacting (1) at least one functional group-containing nucleophile with (2) at least one carbonyl-

containing compound that comprises at least one group that is a leaving group, or that is capable of subsequent conversion to a leaving group, and that optionally comprises one or more isolated carbon to carbon double or triple bonds, to form the corresponding functional group-containing carbonyl-containing compound, said carbonyl-containing compound being selected from the group consisting of ketones and aldehydes; and

(b) reacting said functional group-containing carbonyl-containing compound with at least one alkylidene phosphorane comprising an alkylidene moiety and three other moieties bonded to its phosphorus atom, said alkylidene moiety optionally comprising one or more carbon to carbon double or triple bonds, to form a functional group-containing olefinic compound.

44. A process for preparing 8-dodecenyl acetate comprising the steps of:

(a) reacting butylidenetriphenylphosphorane with 8-bromooctan-1-al to form 8-dodecenyl bromide; and  
(b) reacting said 8-dodecenyl bromide with sodium acetate to form 8-dodecenyl acetate.

45. A process for preparing 11-tetradecenyl acetate comprising the steps of:

(a) reacting propylidenetriphenylphosphorane with 11-bromoundecan-1-al to form 11-tetradecenyl bromide; and  
(b) reacting said 11-tetradecenyl bromide with sodium acetate to form 11-tetradecenyl acetate.

46. A process for preparing 8,10-dodecadienol  
comprising the steps of:

(a) reacting butenylidenetri(*n*-butyl)phosphorane  
with 8-bromooctan-1-al to form 8,10-dodecadienyl  
5 bromide;

(b) reacting said 8,10-dodecadienyl bromide with  
sodium acetate to form 8,10-dodecadienyl acetate; and

(c) hydrolyzing said acetate to form 8,10-  
dodecadienol.

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47. A process for preparing 8,10-dodecadienol  
comprising the steps of:

(a) reacting butenylidenetri(*n*-butyl)phosphorane  
with 8-bromooctan-1-al to form 8,10-dodecadienyl  
15 bromide;

(b) reacting said 8,10-dodecadienyl bromide with  
sodium hydroxide to form the 8,10-dodecadienol.

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